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FOREST PEST MANAGEMENT

3430 Biological Evaluation

R2-84-1

Mountain Pine Beetle Biological Evaluation
Mosier Gulch/Clear Creek Drainage
BLM, Buffalo, Wyoming

1984

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PREPARED BY: Curtis G. O'Neil
Curtis G. O'Neil

APPROVED BY:

Robert D Averill
ROBERT D. AVERILL
Group Leader, Entomology

JAMES R. BEAVERS
Director, Timber, Forest Pest, and Cooperative Forestry Management

Timber, Forest Pest, and
Cooperative Forestry Management
Rocky Mountain Region
USDA Forest Service
11177 West 8th Avenue
Lakewood, Colorado 80225

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ABSTRACT

In 1983 an evaluation was conducted in ponderosa pine occupying 400 acres 1 mile east of the Bighorn National Forest, Wyoming. The purpose was to determine the extent of the beetle infestation and consider viable options to improve and maintain the aesthetics of the infested stands. Low levels of beetle activity were found and are expected to continue at low to moderate levels. Continued infestation will assure continuation of aesthetic decline, particularly in one unique and highly visable stand.

ACKNOWLEDGEMENT

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INTRODUCTION

The mountain pine beetle (MPB) *Dendroctonus ponderosae* (Hopkins) has been integrated with the forest ecosystem for centuries. The MPB is considered a pest when its activities conflict with man's economic and/or aesthetic concerns. Some reasons for these concerns include: reduction of timber value, increases of fire fuel (MPB killed timber), and a reduction of scenic splender (aesthetic degradation). The purpose of the evaluation is to check MPB activity and its impact on the scenic quality in the Mosier Gulch/Clear Creek drainage east of the Bighorn National Forest.

Due to the growing concern over the aesthetic impact of the MPB, the Bureau of Land Management requested that Forest Pest Management Staff conduct a biological evaluation. The purpose of the evaluation is to:

1. Determine the extent of the MPB infestation.

2. Evaluate the trend of the beetle and its impact in the stands.

3. Determine the modes of rehabilitating the scenic quality of the infested stands while managing to reduce future MPB occurrence.

4. Determine effect of stand rehabilitation efforts on wildlife habitat.

METHODS

Evaluation Area: The area, T.50 N., R.83 W., Sec. 2.3, lies along the east end of the Mosier Gulch drainage where it is paralleled by Clear Creek. The area is approximately 2.5 miles x 1 mile and is bordered by the BLM boundary (Figure 1). The west boundary begins 1 mile east of the Bighorn National Forest, extends eastward, and terminates approximately 3.8 miles west of Buffalo, Wyoming. Interstate 16 runs east to west through the stands.

Photo-Interpretation: The evaluation area was delineated into ten separate stands (400 acres total) using 9" x 9" aerial photographs. Topographic features and timber type were used to distinguish separate stands.

Photography Points: Photography points were established along interstate 16 for aesthetic interpretation. The points are located where the infested trees were highly visable from the adjacent interstate.

Cruise Lines: Cruise lines 1 chain wide and 5 to 10 chains in length were established (according to stand size) at 5 chain intervals and marked on

topographic maps prior to visits to the stands. The following data was collected from each cruise line in each stand.

1. Diameter (d.b.h. to the nearest 1 inch) of each attacked tree by MPB infestation class.

   a. Old infested (1980-82)
   b. Current infested (1983)
   c. Recent pitchouts

Variable Plots: Variable plots (10 BAF) were established at 5 chain intervals along each line in each stand. The number of plots per stand varied with stand size ranging from 4 to 8 plots per stand. From each variable plot, the age and height of site trees and diameter of tally trees were collected. A 1/100 acre (11'9.3" radius) circular plot was established in each variable plot to gather the number of regeneration trees.

Statistical Treatment: Trees were tallied and placed into 2 inch diameter classes. Diameter class probability distributions were established to determine the assemblage of diameter classes and the number of trees expected to be lost due to the beetle infestation among these classes. To readily determine the trend of losses in the diameter class distributions, the original eight diameter classes were reduced to three broader diameter classes: <7.1 inch; 7.1-13 inch; and >13 inch classes.

Multiple regression analysis was applied to determine a general trend of infestation phases (increasing, epidemic, decreasing), and trees per acre expected to be lost to MPB over a nine year infestation period. These predictions are summarized in Table 2 (Lessard, 1981).

RESULTS AND DISCUSSION

Area Summary

Data summary for average conditions throughout the survey area is provided in Table 1. Emphasis is placed on the level of mountain pine beetle occurrence. Most stands surveyed were on poor sites, average site index of 50+; basal area 89 sq. ft. per acre. Most mountain pine beetle infestation were detected in pockets of high tree density--often with snow breakage associated with beetle activity. Average infestation level is low with higher levels occurring in pockets.

To date, MPB impact on aesthetics is low in all except for one highly visable stand, 1PP9. Individual stand data is summarized in Tables 4-8.

Wildlife

Removal of beetle infested trees from the stands (especially in highly dense areas) can improve wildlife habitat by allowing development of understory growth. This can provide more forage and cover for wildlife. In addition, more plant and animal species diversity can be supported throughout the treated stands. Otherwise, to allow beetle infested trees to remain will eventually provide food for woodpeckers and other insectivorous wildlife. These would also later become snags and logs for perching and shelter.

TABLE 1--DATA SUMMARY OF ALL STANDS

	DIAMETER OF PONDEROSA PINE BY MPB INFESTATION CLASS						VARIABLE PLOT DATA						
		Uninfest (Var. Plots)	1983 Infested	1982 Infested	Pitch Outs	Snags		Age (Years)	Height (Ft.)	Site Index	BA (10 BAF)	Trees Per acre	Trees Per 1/100 Ac.Plot
Number of Plots	N	57					57						
Number of Trees Tallied			30	49	26	1							
Mean	$\overline{X}$	9	9	10	8	8	$\overline{X}$	91	48	50	89	146	.71
Standard Deviation	S		2.6	4.7	3.1		S	33	10	14	24.5	47	2.4
Total No. Trees Tallied (Var Plot #)		551					# Trees	22	22	22			

Table 2 - SUMMARY OF PREDICTED TREE PER ACRE (T/A) LOSSES IN EACH PHASE OF MOUNTAIN PINE BEETLE INFESTATION

Stand Number	Ponderosa Pine Pre-infestation Current T/A	Increasing Phase T/A Loss	Epidemic Phase T/A Loss	Decreasing Phase T/A Loss	Total Loss Predicted T/A Loss	Post Infestation T/A
1	244.7	11.2	49.0	7.8	68.0	176.70
2	177.3	6.4	6.12	---	12.6	164.7
3	145.8	5.0	10.6	4.14	19.8	126
4	114.1	4.0	21.3	2.5	27.7	86.4
5	215.05	8.2	37.11	5.7	50.9	164.1
6	97.1	4.2	5.3	2.4	12.0	85.1
7	160.1	8.2	12.0	8.3	28.5	132.0
8	116.3	5.5	17.3	5.6	28.4	87.8
9	67.0	3.2	3.0	---	6.2	60.8
10	105.2	4.0	3.7	---	7.7	97.5

MANAGEMENT ALTERNATIVES

1. Do Nothing - Allow beetle activity to continue and accept all losses. This alternative involves such risks as continued aesthetic decline, greater chance of MPB spread to other lands, and increased fire hazards.

2. Chemical Suppression - Cut, buck, and apply EPA approved chemical pesticides to infested trees. This alternative will reduce the beetle population in the area but will not change susceptible stand conditions.

3. Mechanical Suppression - Same as (2) except infested trees are burned or peeled.

4. Preventative Sprays - Green uninfested trees may be treated with Sevimol® prior to beetle flight (July 15). This treatment will prevent attack during the flight period. Preventative spraying is expensive, particularly on steep inaccessible slopes, but less expensive than chemical suppression.

5. Sanitation/Salvage - Remove all infested trees and trees weakened by factors such as root-rot, lightning strike, etc. This alternative will reduce population levels and provide a small reduction in stand susceptability. It also provides for utilization of the ponderosa pine resource.

6. Uneven-aged Management - Uneven-aged stands are less susceptible to MPB infestation than even-aged stands (Lessard, 1981). Uneven-aged stands can be created by single-tree or group selection. Stand structure should be maintained as a typical J-Curve with a dimunition quotient (q) between 1.5-2.0. This alternative will reduce over all stand susceptibility, maintain scenic quality and wildlife habitat, and provide for utilization of the ponderosa pine resource. For uneven-aged management, cuts should be made to a 60 basal area leave tree density. This would allow 40 years before the next cut. See Table 3 for stand diameter distribution. Where possible, Douglas-fir should be favored over ponderosa pine.

TABLE 3 - RESIDUAL STAND STRUCTURES FOR 60 FT^2 OF BASAL AREA WITH MAXIMUM TREE DBH OF 13 FOR TWO Q VALUES

Diameter Distribution	Q = 1.5		Q = 2.0	
Inches	Trees/Acre	Basal Area	Trees/Acre	Basal Area
1	140	1	384	2
3	93	5	192	9
5	62	8	96	13
7	41	11	48	13
9	28	12	24	10
11	18	12	12	8
13	12	11	6	5
Total	394	60	758	60

STAND SUMMARIES

Some differences exist between individual stands; therefore, each stand will be summarized separately. Effects of MPB treatment are displayed on individual stand tables. Suggested treatments for individual stands are given in individual stand summaries.

Stand 1PP9 - Stand summary data for stand 1PP9 is provided in Table 4. The stand has an average of 104 sq.ft./acre basal area; 217 trees per acre (ponderosa pine component) and 3 sq.ft./acre basal area; 12 trees per acre (Douglas-fir). Average site index is 50+. This stand differs from others in that it has a mixed component of ponderosa pine, Douglas-fir, and spruce. It is on a north facing slope and has more competition between and within species.

Management alternatives 5 and 6 are recommended for stand 1PP9. These alternatives will provide aesthetic improvement, uneven-ageness, reduced susceptibility to MPB, and allow easier conversion of type (particularly Douglas-fir). Without management, losses up to ca. 28% of the resource should be expected.

Stand 2PP12 - The stand summary data for stand 2PP12 is provided in Table 4. The stand has an average basal area of 107 sq.ft./acre, 177 trees/acre. Average site index is 50+.

Management alternative 1 (do nothing) is recommended in stand 2PP12 because the stand has sustained very little infestation and has open growing conditions not likely to sustain high levels of future infestation. Without management, losses up to ca. 7% of the timber resource should be expected.

TABLE 4 - STAND SUMMARY FOR STANDS 1PP9 AND 2PP12

	Diameter of Ponderosa pine (in.) by MPB infestation class									Diameter of other spec.	
	Uninfested	1983 Infested	1982 Infested	Pitch Out	Age (yrs)	Height (ft)	Site Index	BA (ft) /AC	AC (Var.plot)	Doug-fir	Spruce
Stand 1PP9											
Current Stand	9.8	8.4	9.7	7.1	65.6	46.6	60	128	244	7.0	
Alternative 1	8.1							83	176	7.0	
Alternatives 2, 3, & 5	7.5							90	233	7.0	
Alternative 4								90	233		
Alternative 6	8.4							60	*161-186	7.0	
Stand 2PP12											
Current Stand	12.6	---	---	8.4	79.0	41.6	50	107	177.3		
Alternative 1	8.9							82	164.7		
Alternatives 2, 3, & 5	8.9							86	170.8		
Alternative 4								86	170.8		
Alternative 6	8.9							60	*161-186		

* 161 trees/acre (T/A) for Q = 1.5; 186 trees/acre (T/A) for Q = 2.0

Stand 3PP12 - Stand summary data for stand 3PP12 is in Table 5. The stand has an average basal area of 104.5 sq.ft./acre and 146 trees/acre. Site index is 50+.

Management alternatives 5 and 6 are recommended. Without management the stand could sustain losses up to ca. 14% of its timber resource.

Stand 4PP11 - Stand summary data for stand 4PP11 is provided in Table 5. The average basal area is 63.0 sq.ft./acre (all ponderosa pine) has an average of 114.2 trees/acre and site index of 50+. Mountain pine beetle activity detected in this stand was associated with snow damaged trees.

Management alternative 5 is recommended. Trees with heavy snow damage should be removed with all infested and recently pitched-out trees. Without management the beetle population could build up around these snow damaged areas and up to ca. 24% of the stands ponderosa pine resource could be lost.

TABLE 5 - STAND SUMMARY FOR STANDS 3PP12 AND 4PP11

	Diameter of Ponderosa pine (in.) by MPB infestation class								
	Uninfested	1983 Infested	1982 Infested	Pitch Out	Age (yrs)	Height (ft)	Site Index	BA(PP) (ft) /AC	Trees / Acre (25 in)
Stand 3PP12									
Current Stand	12.67	---	---	---	---	48	50+	106.8	145.8
Alternative 1	10.0							80	125.9
Alternatives 2, 3, & 5	9.9							87	140.7
Alternative 4	9.9							87	140.7
Alternative 6								60	*161-186
Stand 4PP11									
Current Stand	11.77	9.9	10.2	11.4	103.2	52.0	50	63	115.9
Alternative 1	8.3							37	86.4
Alternatives 2, 3, & 5	8.6							50	110.2
Alternative 4	8.6							50	110.2
Alternative 6								60	*161-186

* 161 trees/acre (T/A) for Q = 1.5; 186 trees/acre (T/A) for Q = 2.0

Stand 5PP9 - Stand summary data for stand 5PP9 is provided in Table 6. The average basal area is 113 sq.ft./acre and 215 trees/acre (all ponderosa pine). The site index of stands is 50+.

Management alternatives 5 and 6 are recommended. In the absence of management, up to ca. 24% of the ponderosa pine resource could be lost.

Stand 6PP12 - Data summary for stand 6PP12 is displayed in Table 6. The stand has an average basal area of 74.3 sq.ft./acre and 97 trees/acre (ponderosa pine). Site index is 60+

Management alternative 5 is recommended. If no management is done, up to ca. 12% of the timber resource may be lost.

TABLE 6 - STAND SUMMARY FOR STANDS 5PP9 AND 6PP12

	Diameter of Ponderosa pine (in.) by MPB infestation class								
	Uninfested	1983 Infested	1982 Infested	Pitch Out	Age (yrs)	Height (ft)	Site Index	BA(PP) (ft) /AC	Trees / Acre (25 in)
Stand 5PP9									
Current Stand	10.0			9.9	85.5	48.25	50+	113	215.0
Alternative 1	8.0							64	164.0
Alternatives 2, 3, & 5	8.4							86	206.8
Alternative 4	8.4							86	206.8
Alternative 6	8.0							60	90-99
Stand 6PP12									
Current Stand	12.0	14.0	10.9	---	69.5	37.5	60+	74	97.1
Alternative 1	10.7							56	85.1
Alternatives 2, 3, & 5	10.3							60	92.9
Alternative 4	10.3							60	92.9
Alternative 6	10.7							60	90-99

Stand 7PP11 - Data summary for stand 7PP11 is provided in Table 7. Average basal area of the stand is 113 sq.ft./acre and 160 trees/acre density (ponderosa pine).

Management alternatives 5 and 6 are recommended. If alternative 1 (do nothing) is chosen, up to 18% of the ponderosa pine resource could be lost.

Stand 8PP13 - Stand summary data for stand 8PP13 is provided in Table 7. The average basal area is 113 sq.ft./acre and 116 trees per acre (ponderosa pine).

Management alternatives 5 and 6 are recommended. Cut infested and pitched out trees. In pockets of high beetle caused mortality, group selection can be used. This should promote regeneration in these areas. Under no management, the stand could sustain losses up to ca. 24% of its timber resource.

TABLE 7 - STAND SUMMARY FOR STANDS 7PP11 AND 8PP13

	Diameter of Ponderosa pine (in.) by MPB infestation class								
	Uninfested	1983 Infested	1982 Infested	Pitch Out	Age (yrs)	Height (ft)	Site Index	BA(PP) (ft) /AC	Trees / Acre (25 in)
Stand 7PP11									
Current Stand	11.8			15.2	---	50.0		113	160.1
Alternative 1	10.1							85	131.6
Alternatives 2, 3, & 5	10.0							90	151.8
Alternative 4	10.0							90	151.8
Alternative 6								60	*161-186
Stand 8PP13									
Current Stand	13.8				113.6	53.0		104	116.3
Alternative 1	11.5							81	87.8
Alternatives 2, 3, & 5	11.4							88	110.8
Alternative 4	11.4							88	110.8
Alternative 6								60	*161-186

* 161 trees/acre (T/A) for Q = 1.5; 186 trees/acre (T/A) for Q = 2.0

Stand 9PP14 - Data summary for stand 9PP14 is provided in Table 8. The average basal area of this stand is 52 sq.ft./acre. It has an average of 67 trees/acre (ponderosa pine). The site index is 50+.

Management alternative 1 (do nothing) is recommended in this stand because it has very little mountain pine beetle activity and has open growing conditions (little or no competition between trees). If management for aesthetic purposes is preferred, then Alternative 5 is recommended. Under no management, tree losses up to ca. 9% should be expected.

Stand 10PP13 - Data summary for stand 10PP13 is provided in Table 8. This stand has an average basal area of 75 sq.ft./acre and 105 trees/acre (ponderosa pine). The site index is 50+.

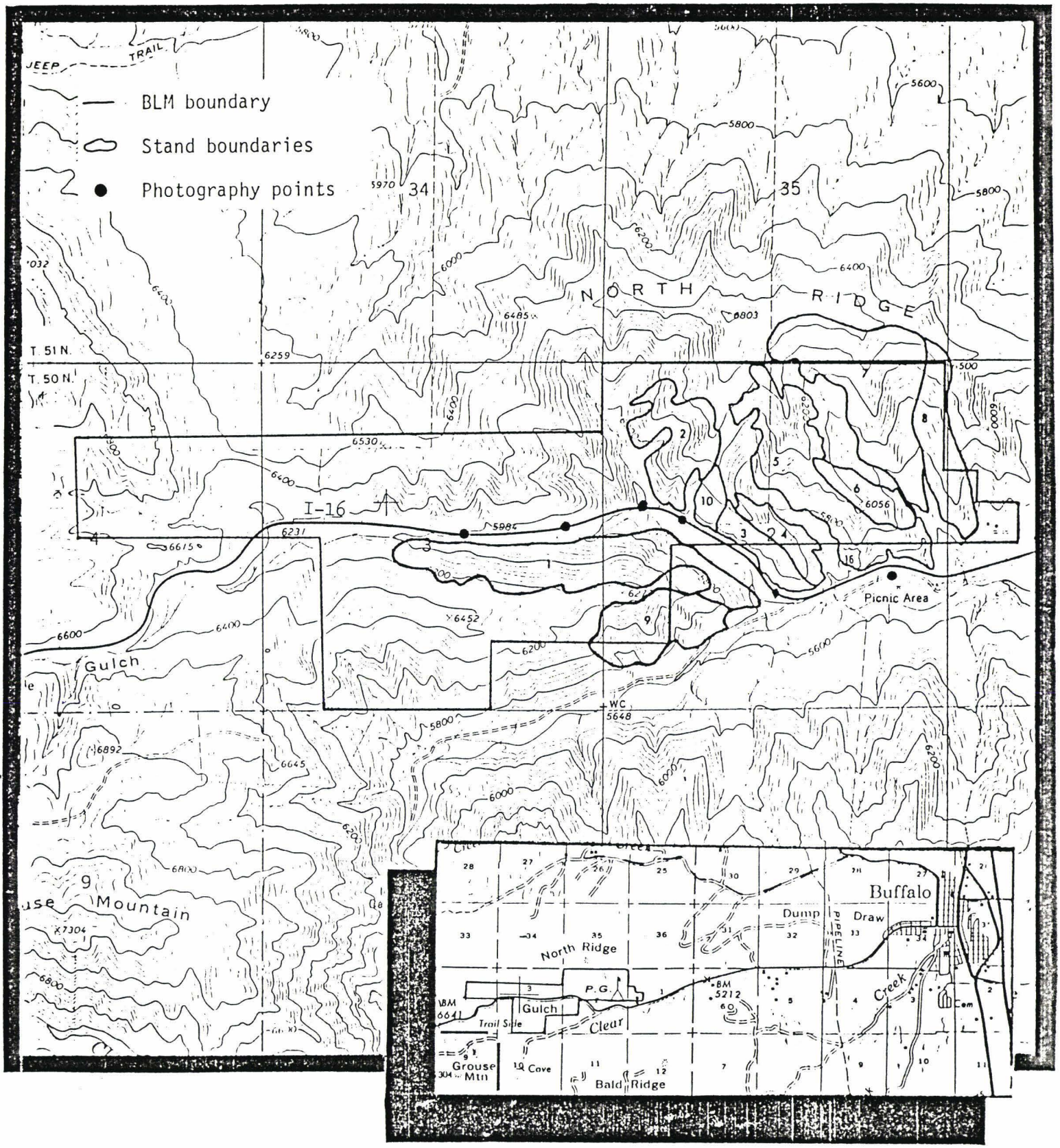
Management alternative 1 (do nothing) is recommended in this stand because it is practically free of mountain pine beetle infestation. If management for aesthetics is conducted, then Alternative 5 is recommended. Under no management, losses up to ca. 7% should be expected.

TABLE 8 - STAND SUMMARY FOR STANDS 9PP14 AND 10PP13

	Diameter of Ponderosa pine (in.) by MPB infestation class								
	Uninfested	1983 Infested	1982 Infested	Pitch Out	Age (yrs)	Height (ft)	Site Index	BA(PP) (ft) /AC	Trees / Acre (25 in)
Stand 9PP14									
Current Stand	14.6	---	---	---	92.0	45.3	50	52	67.0
Alternative 1	10.4							41	60.8
Alternatives 2, 3, & 5	10.3							43	63.8
Alternative 4	10.3							43	63.8
Alternative 6									
Stand 10PP13									
Current Stand	13.1	---	---	---	122	55	50	75	105.25
Alternative 1	7.6							50	97.54
Alternatives 2, 3, & 5	9.8							58	101.3
Alternative 4	9.8							58	101.3
Alternative 6									

APPENDIX

Fig. 1 -- Mosier Gulch Mountain Pine Beetle Evaluation Area.



The following photographs were taken at the photo points indicated on the area map. The pictures give some indication of the high visability of the stand (No. 1) and MPB attacked trees within it.

Figure 2: Facing west toward picnic area south of stand No. 5.

Figure 3: Approaching stand No. 1 from east to west. Notice first visable faders (center).

Figure 4: Faders become more evident along the stand south of the Interstate.

Figure 2

Figure 3

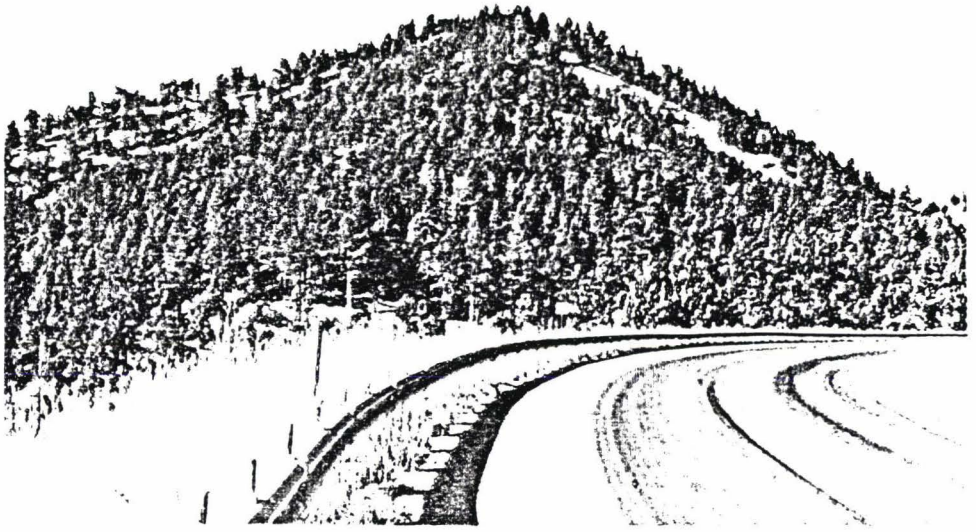


Figure 4

Figure 5: Stand 1 - Faders highly visible at closest point between stand and interstate.

Figure 6: Approaching same stand from west to east.

Figure 7: Further along Stand 1, west to east. Faders highly visible to both eastbound and westbound motorists.

Figure 5

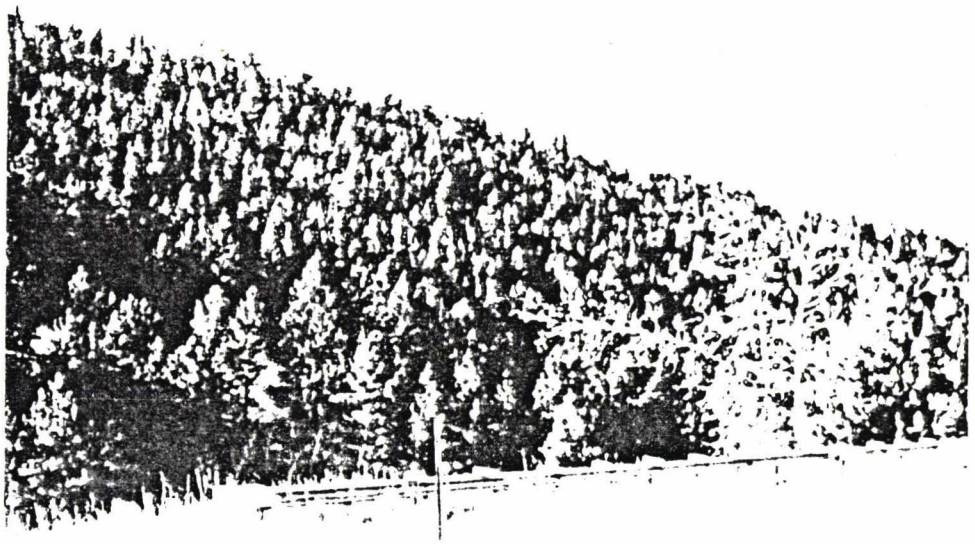


Figure 6

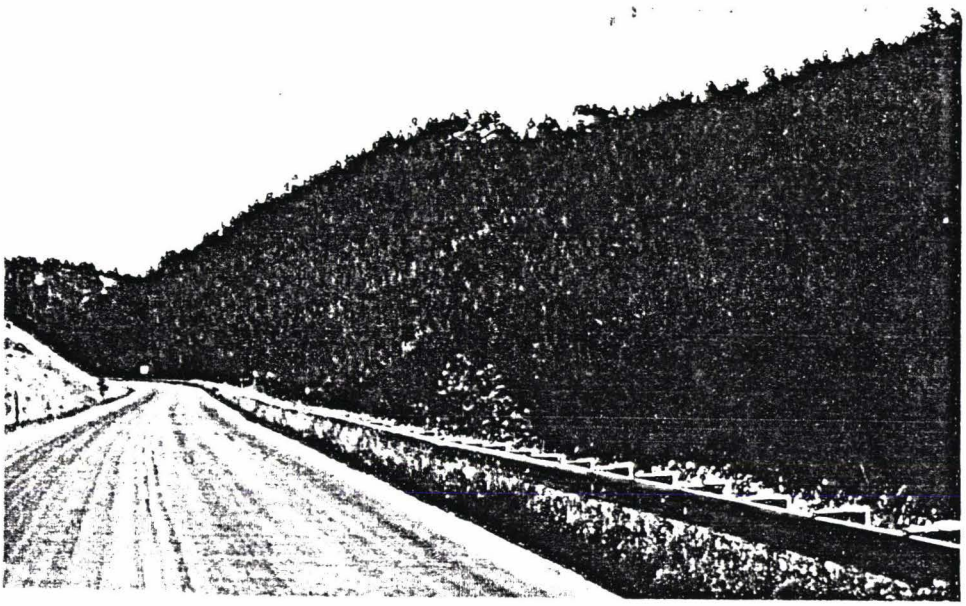
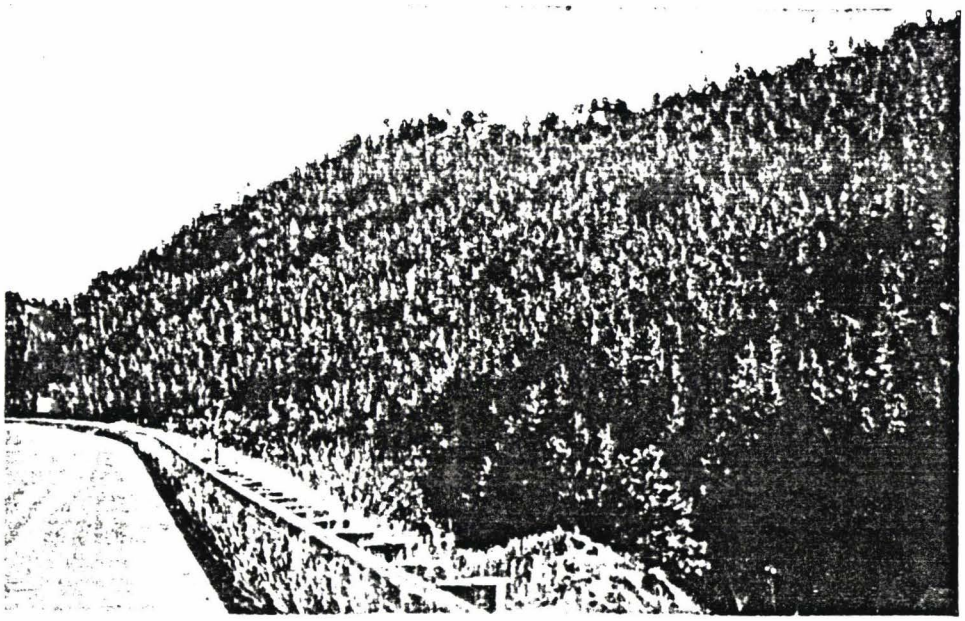


Figure 7



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